WASHINGTON STATE LEGISLATURE

Office of the State Actuary

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TO: Jane Sakson, Budget Assistant to the Governor
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CC: Matt Smith, FCA, MAAA, EA, State Actuary
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RE: **RATES OF RETURN INITIATING CONTRIBUTION RATE FLOORS IN HB 2681 (CHAPTER 365, LAWS OF 2006)**

Summary of Request

This memo presents our findings regarding possible rates of return on assets that could initiate the member and employer normal cost contribution rate floors and Unfunded Actuarial Accrued Liability (UAAL) amortization contribution rate floors in the law in Chapter 365, Laws of 2006, that was the result of HB 2681. This is in response to your question: "What rates of return would kick in the contribution rate floors over the six-year period commencing upon the effective date of the bill for PERS, TRS, and SERS?"

Summary of Results

We realized that to reasonably answer your question we had to accurately model rate of return volatility. We used two methods to model volatility in rates of return for the six-year period from 2005-2010. Our first method involved calculating a specific rate of return variation for each of the six years from 2005-2010 based on actual variations from the average rate of return from 2000-2005. We then applied those individual year rate of return variations to a new base rate of return. The second method used two sets of actual six-year rates of return (1993-1998 and 1999-2004) and proceeded as if each set of rates of return repeated itself from 2005-2010. We looked at the impact the various rates of return during 2005-2010 had on the various contribution rates, UAAL, member and employer normal cost, from 2009-2015 (three biennia from the effective dates of the law).

For the Plan 1 amortization rate floors specified in the law, a compounded annual rate of return of 13.7 percent to 14.1 percent, over the six-year period (2005-2010), would more likely than not produce employer UAAL contribution rates below the floors in the final two years of the six-year period commencing upon the effective dates of the law. Likewise, for the Plan 2/3 member and employer normal cost contribution rate floors to be initiated, a compounded annual rate of return from 2005-2010 of 9.6 percent to 11.0 percent for the members' floors and 11.3 percent to 14.0 percent for the employers' normal cost floors would likely be required for PERS and SERS. TRS member contribution rate floors would be initiated with compounded annual rates of return from 2005-2010 as low as 7.8 percent, whereas TRS employer normal cost floors would require higher compounded annual rates of return around 13.8 percent. These results are based on a six-year projection of rates of return with the same volatility as was observed during the six years from 2000 to 2005. By the design of this method the contribution rate floors were only initiated for the 2013-2015 biennium.

Our second method looked at how many times the floors would have been initiated between 2009-2015 if the exact same historical rates of return for two recent six-year periods were experienced again. If the relatively high returns from 1993 to 1998 repeated themselves, the PERS 1 and TRS 1 UAAL and all Plan 2/3 employer normal cost floors would apply for two out of the six years. PERS and SERS Plan 2/3 member floors would apply for four of the six years and TRS 2/3 member floors would apply for all six years. If the relatively low returns of 1999 to 2004 repeated themselves, only the TRS 2/3 member floor would be initiated and it would most likely apply for four of the six years. This method allowed for the various contribution rate floors to be initiated more or less frequently in the three biennia under consideration.

Rate of Return Summary

The following table shows the compounded annual rates of return that would be required over the six-year period from 2005-2010 to initiate the floors in the 2013-2015 biennium for each system and plan by our first method using a specific rate of return variation for each year from 2005-2010.

	Member	Employer UAAL	Employer Normal Cost
PERS 1		14.04%	
PERS 2/3	10.91%		11.31%
TRS 1		13.77%	
TRS 2/3	7.74%		13.79%
SERS 2/3	9.61%		13.98%

Analysis of Floors and Projected Contribution Rates

The floors for PERS 1 and TRS 1 are specified in the bill. The floors for the Plans 2/3 are based on 80 percent of the Entry Age Normal (EAN) cost rates. The EAN cost rate is a rate that approximates the long-term cost of the plan and is independent of asset gains and losses.

Changes in the EAN cost from 2006 legislation have not been included in any of the calculations for this memo. The following table summarizes the floors based on the EAN cost rates from the 2004 Actuarial Valuation Report (AVR), excluding gain sharing:

	Member Plan 2	Employer Normal Cost	Employer Plan 1 UAAL	Total Employer
Minimum Contribution Rate (or Floor) Excluding Gain Sharing				
PERS	3.57%	3.57%	2.68%	6.25%
TRS	4.34%	4.34%	4.71%	9.05%
SERS	3.77%	3.77%	2.68%	6.45%

The following table summarizes the floors based on the 2004 AVR, including gain sharing:

	Member Plan 2	Employer Normal Cost	Employer Plan 1 UAAL*	Total Employer
Minimum Contribution Rate (or Floor) Including Gain Sharing				
PERS	3.57%	3.65%	2.68%	6.33%
TRS	4.34%	5.04%	4.71%	9.75%
SERS	3.77%	4.39%	2.68%	7.07%

The PERS 1 and TRS 1 UAAL rates are specified in the law and exclude the cost of future gain sharing.

The following table summarizes the 2009 projected contribution rates based on the 2004 AVR, including gain sharing (more detail on the projected contribution rates is shown in the appendix):

	Member Plan 2	Employer Normal Cost	Employer Plan 1 UAAL	Total Employer
Projected 2009 Contribution Rates Including Gain Sharing				
PERS	4.20%	4.45%	3.60%	8.05%
TRS	4.41%	5.90%	6.16%	12.06%
SERS	4.60%	6.69%	3.60%	10.29%

The following table summarizes the floors as a percent of the projected 2009 contribution rates, including gain sharing:

	Member Plan 2	Employer Normal Cost	Employer Plan 1 UAAL	Total Employer
Rate Floors as a Percent of Contribution				
PERS	85%	82%	74%	79%
TRS	98%	85%	76%	81%
SERS	82%	66%	74%	69%

Years to Initiate Floor Based on Actual Returns

We looked at two periods of actual returns to determine if and when the floors would apply during the six years from 2009 to 2015 if the same patterns of rates of return were repeated (actual rates of return are shown in Appendix 2). We chose two historical periods of six years and applied the rates of return of those six-year periods to our projections in the years from 2005-2010 for the valuations in 2007, 2009, and 2011. These projected valuations produced the contribution rates for the six years from 2009 to 2015.

The historical rates of return we chose were from 1993-1998 and 1999-2004. We selected these periods for two reasons. First, they were actual experienced rates of return. Second, the first period experienced very high rates of return and the second period experienced both moderate returns and losses, providing information about the affect of both exceptional and average rates of return. We applied the rates of return to our projections from 2005-2010 and looked at two things per system and plan: when and how frequently the contribution rate floors were initiated during the six-year period from 2009-2015.

Using the rates of return for the six-year period ending 1998, the commingled trust fund (CTF) experienced a relatively high compounded annual rate of return of 14.13 percent. In the projections the employer normal cost and UAAL rate floors were only initiated in the 2013-2015 biennium for all systems. For PERS and SERS Plan 2/3 member contribution rates, the floors were initiated in both the 2011-2013 and 2013-2015 biennia. The TRS Plan 2/3 member rate floors were initiated in all three biennia from 2009-2015.

Using the rates of return for the six-year period ending 2004, the CTF experienced a relatively low compounded annual rate of return of 5.27 percent. The floors were not initiated in any of the three biennia under this scenario for any system or plan except TRS Plan 2/3 when the member floor applied for two biennia from 2011-2015. These results are summarized in the table below:

	Floor Initiations for Projected Six-Year Period **Using Actual Historic Rates of Return**			
Years	**1993-1998**		**1999-2004**	
Plan	**Number of Years of Floor**	**First Year**	**Number of Years of Floor**	**First Year**
PERS 1	2	2013	0	n/a
PERS 2/3 member	4	2011	0	n/a
PERS 2/3 employer	2	2013	0	n/a
TRS 1	2	2013	0	n/a
TRS 2/3 member	6	2009	4	2011
TRS 2/3 employer	2	2013	0	n/a
SERS 2/3 member	4	2011	0	n/a
SERS 2/3 employer	2	2013	0	n/a

For both sets of actual rates of return we examined, the assets experienced a great deal of smoothing. The 1993-1998 rates of return had an average smoothing period of 7.5 years with a minimum smoothing period of six years and the 1999-2004 rates of return had an average smoothing period of 6.5 years with a minimum smoothing period of four years. The sensitivity of the contribution rates to the asset smoothing was noticeable. The projected contribution rates were affected heavily by the projected asset smoothing.

Using the 1993-1998 rates of return in our projections, the very high returns on assets late in the six-year period are not realized quickly enough to initiate the employer normal cost floor until the 2013 biennium. The floors on the member contribution rates are projected to be initiated at least one biennium sooner. Using the 1999-2004 rates of return, the floors are not initiated during the six years, except for the TRS Plan 2/3 member rate floor.

Assumptions and Methods

For this study we relied on the results of the 2004 AVR for PERS, TRS, and SERS along with the projections that were used to develop the projected contribution rates. We used the same methods and assumptions as disclosed in the 2004 AVR.

We prepared deterministic contribution rate projections based on the impact of six years of rates of return, from 2005-2010, to determine when and how often the contribution rate floors would apply over a six-year period, 2009-2015, and what rates of return would initiate those floors. We used two methods to determine which rates of return to plug into our projections. The first method was based on using a set of six variations from an average rate, one for each year from 2005-2010. The variations were calculated from the six years of historical annual rates of return reported by the Washington State Investment Board (WSIB), from 2000-2005. We took the geometric average of those rates of return and for each year from 2000-2005 looked at the difference from the average. This produced the six variations we used in the projection from 2005-2010. In the projection we selected a base rate of return; essentially a new average rate of return for the six-year period. We changed the base rate of return until the contribution rate floor was projected to be initiated in the 2011 AVR for the 2013-2015 biennium. We repeated this process for each system and plan to produce the results in this memo.

The WSIB returns for 2000 through 2005 were used for asset smoothing purposes prior to the period of rate of return focus from 2005-2010 and to calculate our six individual year variations:

	2000	2001	2002	2003	2004	2005
Annual Return	14.19%	-5.96%	-6.40%	4.15%	16.20%	13.34%

These six years correspond to a compounded annual rate of return of 5.50 percent. The six years of variations from the average annual rate of return of 5.50 percent are shown below. For example, for the year 2000, the variation from the average annual rate of return is 8.69 percent, because: 14.19% = 8.69% + 5.50%.

	2000	2001	2002	2003	2004	2005
Annual Variation	8.69%	11.46%	11.90%	-1.35%	10.70%	7.84%

For example, if it was determined that a six-year compounded annual rate of return of 10 percent is required to initiate the floor in the third biennium of the projection, we would have used 18.69 percent, -1.46 percent, -1.90 percent, 8.65 percent, 20.70 percent, and 17.84 percent as the rates of return for the six years from 2005-2010. If it was determined that a six-year compounded annual rate of return of 11.50 percent is required to initiate the floor in the third biennium, we would have used 20.19 percent, 0.04 percent, -0.40 percent, 10.15 percent, 22.20 percent, and 19.34 percent as the rates of return from 2005-2010.

In the second method we chose two sets of actual rates of return over a six-year period. We chose the rates of return from 1993-1998 and 1999-2004 for the reasons discussed above. We proceeded as if each set of these rates of return repeated itself from 2005-2010. For each set of rates of return we looked at the projected contribution rates in the three biennia from 2009-2015. We compared timing and frequency of the various rate floor initiations for each system and plan.

Additional Information

The results would be different for periods with duration other than six years. The compounded annual rates of return required to initiate the floors in our first method would be greater for a time-horizon of less than six years and less for a time-horizon of greater than six years. The results are based on the expected rate of return, the unrecognized gains and losses, and the funded ratios as of the 2004 valuation date. Changes in the expected rate of return, the amount of the unrecognized gains and losses, and funded ratios would change the rates of return required to initiate the floors. The results are only estimates and should be used for planning purposes only. The floors and other contribution rates used in this analysis exclude the impact of 2006 legislation.

The assumptions and methods used in this analysis are reasonable and appropriate for the primary purpose stated above. The use of another set of assumptions and methods, however, could also be reasonable and could result in materially different results.

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Appendix 1 – Projected Contribution Rates

The following tables show the projected contribution rates, based on the 2004 valuation and reflecting legislative changes enacted during the 2006 legislative session. The PERS employer rate shown for 2006-2007 includes the 1.77 percent Plan 1 UAAL rate effective January 1, 2007.

Employee Contribution Rates	2005-2006	2006-2007	2007-2008	2008-2009	2009-2011
PERS					
Plan 2 Member Rate	2.25%	3.50%	4.06%	4.74%	4.20%
TRS					
Plan 2 Member Rate	2.48%	3.01%	3.05%	3.54%	4.41%
SERS					
Plan 2 Member Rate	2.75%	3.79%	4.32%	4.74%	4.60%

Employer Contribution Rates	2005-2006	2006-2007	2007-2008	2008-2009	2009-2011
PERS					
Base Normal Cost Rate	2.25%	3.50%	4.06%	4.74%	4.20%
Plan 1 UAAL Rate	0.00%	1.78%	1.76%	2.64%	3.14%
Rate to pre-fund Gain-Sharing	0.00%	0.00%	0.71%	0.71%	0.71%
DRS Expense Rate	0.19%	0.19%	0.19%	0.19%	0.19%
Total Employer Rate	2.44%	5.47%	6.72%	8.28%	8.24%
TRS					
Base Normal Cost Rate	2.73%	3.26%	3.30%	3.79%	4.66%
Plan 1 UAAL Rate	0.00%	1.30%	2.56%	3.84%	5.22%
Rate to pre-fund Gain-Sharing	0.00%	0.00%	2.18%	2.18%	2.18%
DRS Expense Rate	0.19%	0.19%	0.19%	0.19%	0.19%
Total Employer Rate	2.92%	4.75%	8.23%	10.00%	12.25%
SERS					
Base Normal Cost Rate	2.75%	3.79%	4.32%	4.74%	4.60%
Plan 1 UAAL Rate	0.00%	0.88%	1.76%	2.64%	3.14%
Rate to pre-fund Gain-Sharing	0.00%	0.00%	2.55%	2.55%	2.55%
DRS Expense Rate	0.19%	0.19%	0.19%	0.19%	0.19%
Total Employer Rate	2.94%	4.86%	8.82%	10.12%	10.48%

Appendix 2 – Investment Returns of the Commingled Trust Funds

Year	ROR	Year	ROR	Year	ROR	Year	ROR
2004	16.2%	1979	14.87%	1954	36.83%	1929	-11.37%
2003	4.15%	1978	6.77%	1953	-0.25%	1928	27.35%
2002	-6.40%	1977	1.20%	1952	9.83%	1927	24.03%
2001	-5.96%	1976	27.27%	1951	11.15%	1926	8.19%
2000	14.19%	1975	30.50%	1950	21.58%		
1999	11.90%	1974	-15.33%	1949	13.81%		
1998	16.60%	1973	-11.99%	1948	3.57%		
1997	20.50%	1972	11.88%	1947	1.87%		
1996	17.40%	1971	13.87%	1946	-5.39%		
1995	16.50%	1970	4.52%	1945	32.02%		
1994	1.40%	1969	-10.60%	1944	19.61%		
1993	13.40%	1968	11.63%	1943	27.85%		
1992	8.20%	1967	22.62%	1942	18.00%		
1991	9.50%	1966	-5.11%	1941	-6.18%		
1990	8.30%	1965	12.87%	1940	-3.62%		
1989	13.50%	1964	13.11%	1939	1.70%		
1988	4.20%	1963	15.12%	1938	22.05%		
1987	16.90%	1962	-3.29%	1937	-25.42%		
1986	26.90%	1961	18.90%	1936	29.26%		
1985	29.80%	1960	3.88%	1935	31.46%		
1984	-0.03%	1959	7.69%	1934	7.87%		
1983	47.30%	1958	29.44%	1933	51.03%		
1982	2.50%	1957	-4.44%	1932	0.43%		
1981[2]	0.22%	1956	1.45%	1931	-29.72%		
1980	20.45%	1955	17.84%	1930	-15.60%		

[1] Returns calculated for fiscal years ending June 30. Results differ from those reported for valuation years, which end September 30.
[2] Rates for years prior to 1982 are approximations.